From:	Joh Taylor
To:	"Kathryn Markham"
Subject:	FW: AHB historic coatings - where and how much/thick
Date:	Wednesday, 22 September 2010 1:27:05 PM
Attachments:	TNZ C26 Update.doc guidelines.doc model policy.doc TNZ C26 cleaning-recoating-steelwork-notes[1].pdf

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From: Willie Mandeno [mailto:s9(2)(a) @opus.co.nz]
Sent: Wednesday, 22 September 2010 1:16 p.m.
To: 'Joh Taylor'
Cc: Jon Patman
Subject: RE: AHB historic coatings - where and how much/thick

Joh
As discussed today, I have attached various documents on dealing with lead on bridges, that I have been involved with. Recommend you have a look at AS 4361.1 which was heavily plagiarised in our attached Guidelines.doc
I am not aware of any lead being used on AHB external steelwork other than the first section of steel erected which I understand was only part of the Southern-most span. The spec was then changed to a high performance system involving abrasive blast cleaning to remove mill scale and apply a 25 micron coat of flame sprayed zinc and then the zinc chromate primed phenolic/MIO alkyd system which has all been documented elsewhere, and hope you have this info. As the bridge was built from both ends there may have been some at the Northern end but don't know if this has ever been confirmed. There were drawings showing which areas were repainted at different years but these should be in the AHB office.
Cheers
Willie

From: Joh Taylor [mailto:Johanna.Taylor@opus.co.nz]
Sent: Thursday, 9 September 2010 2:21 p.m.
To: 'Willie Mandeno'
Subject: FW: AHB historic coatings - where and how much/thick

Hi Willie – how are you going?
Wondering if you have or know of any sources of information about where the different historic coatings are on the bridge, and possible thicknesses/layers. We are at the stage of our consent application project where we may need to draw quantitative conclusions about the amount of the recent and historic contaminants that come off (*eg* during wet and dry abrasive blasting) and therefore need to understand quite firmly what is where, and how much (thick).

We have looked through the information you've sent (paint trials etc) and it doesn't appear to be in there.

One key question for us relates to lead. We know lead based paint is on Span 7 (and in the box girders, and possibly in chords/diagonals?) but not sure if it may also be anywhere else. We have done some soil sampling at Stokes Point which shows lead spikes so we are now trying to work out what the source might be (lead in petrol residues and lead paint off old homes may be sources, but we also want to know if there may be lead on the bridge at the northern end that

may be being blasted off and settling / building up in the soils).

Do you have any such info and/or ideas on how we can find out? (I've told Jon P I would ask you, pls cc him your reply)

Thanks so much, Joh

Update of TNZ C26 Specification for the cleaning and recoating of steelwork coated with lead based paint

The following are referenced as key documents in C26:

Standard as noted in C26		Status	Comments / correct title (from NZS or AS)
AS 4361.1 - 1995	Guide to lead paint management, Part 1: Industrial applications	Current	AS 4361.1 - 1995 : Guide to lead paint management - Industrial applications
NZS/AS 1627.1	Cleaning using liquid solvents and alkaline solutions	Withdrawn	Replaced by AS only standard: AS 1627.1 - 2003 : Metal finishing - Preparation and pretreatment of surfaces - Removal of oil, grease and related contamination
NZS/AS 1627.2	Power tool cleaning	Withdrawn	Replaced by AS only standard: AS 1627.2 - 2002 : Metal finishing - Preparation and pretreatment of surfaces - Power tool cleaning
NZS/AS 1627.4	Abrasive blast cleaning	Withdrawn	Replaced by AS only standard: AS 1627.4 - 2005 : Metal finishing - Preparation and pretreatment of surfaces - Abrasive blast cleaning of steel
NZS/AS 1627.9	Pictorial surface preparation standards (ISO 8501-1 or SIS 05 5900)	Withdrawn	Replaced by AS only standard: AS 1627.9 - 2002 : Metal finishing - Preparation and pretreatment of surfaces - Pictorial surface preparation standards for painting steel surfaces
AS/NZS 1716	Respiratory protective devices	Current	
AS/NZS 2310	Glossary of paint and painting terms	Current	
AS/NZS 2312	Guide to the protection of iron and steel against exterior atmospheric corrosion	Current	AS/NZS 2312:2002 Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings
AS 2800	Ambient air - Determination of particulate lead - High volume sampler gravimetric collection	Current	AS 2800 - 1985 : Ambient air - Determination of particulate lead - High volume sampler gravimetric collection - Flame atomic absorption spectrometric method
NZS/AS 3894.3	Site Testing of Protective Coatings. Method 3: Determinations of dry film thickness	Withdrawn	Replaced by AS only standard: AS 3894.3 - 2002 : Site testing of protective coatings - Determination of dry film thickness

Standard as noted in C26		Status	Comments / correct title (from NZS or AS)
AS/NZS 3894.6	Method 6: Determination of residual contaminants	Withdrawn	Replaced by AS only standard: AS 3894.6 - 2002 : Site testing of protective coatings - Determination of residual contaminants
NZS/AS 3894.10	Part 10: Inspection report - Daily	Withdrawn	Replaced by AS only standard: AS 3894.10 - 2002 : Site testing of protective coatings - Inspection report - Daily surface and ambient conditions
NZS/AS 3894.12	Part 12: Inspection report - Coating	Withdrawn	Replaced by AS only standard: AS 3894.12 - 2002 : Site testing of protective coatings - Inspection report - Coating
NZS 3910	Conditions of Contract for building and civil engineering construction	Current	
NZS 4203	General structural design and design loadings for buildings	Current	Although Parts 1 and 2 are current the standard is replaced by AS/NZS 1170 Structural Design Actions
NZS/BS 4800	Schedule for paint colours for building purposes	Withdrawn	Although withdrawn the parent code remains current (but is work in hand), i.e.: BS 4800:1989 Schedule of paint colours for building purposes
NZS 6703	Code of practice for interior lighting design	Current	
ISO 2063	Metal spraying of zinc and aluminium	Current	ISO 2063:2005 Thermal spraying - Metallic and other inorganic coatings - Zinc, aluminium and their alloys

The following are given as material specifications:

Generic Type	Standard Spec	APAS Spec.	Comment
Inorganic Zinc Silicate (IZS)	AS/NZS 3750.15/4	2908	Standard is current
Inorganic Zinc Silicate ("High ratio")	AS/NZS 3750.15/6	2908	Standard is current
Zinc Rich Epoxy (ZnE)	AS/NZS 3750.9/2	2916	Standard is current
Epoxy Primer (EPP)	AS/NZS 3750.13	2971	Standard is current
Zinc Phosphate Alkyd Primer (ZPA)	AS 4089	2921	AS 4089-1993 superseded by AS/NZS 3750.19: 2008
HB Epoxy (HBE)	AS/NZS 3750.14	2973	Standard is current
Alkyd MIO (MIOA)	AS/NZS 3750.12	2910	Standard is current
Epoxy Mastic (EM)	AS 3750.1	0156	AS 3750.1-1994 superseded by AS/NZS 3750.1: 2008
Acrylic Latex (ACL)	AS/NZS 3750.5	2901	Standard is current. 2901 not listed by APAS
Polyurethane (PU)	AS/NZS 3750.6	2911	Standard is current
Moisture cure urethane (MCU)	AS 3750.18	2930	Standard is current

Message: 33 / 42
Date: Fri, 27 Feb 2009 16:04:57 +1300
From: "Nigel Lloyd" <Nigel.Lloyd@nzta.govt.nz>
To: <Willie Mandeno <s9(2)(a) @opus.co.nz>
Subject: Update of TNZ C26

Willie,

As discussed earlier today NZTA are rebranding our specifications from Transit to NZTA. I'm checking through C26 Specification for the cleaning and recoating of steelwork coated with lead paint and note that a number of the standards referenced are no longer current.

I don't want to simply change the references without checking that there are no unwanted implications from doing so. Also there is one standard and one material specification that have been withdrawn for which I cannot immediately find an obvious substitute.

The attached summarises what I have established so far. If you could check the details or let me know what you have previously established then that would be most helpful.

Also whilst the specification is under review are there any significant issues with it that you feel should be addressed whilst we have the opportunity?

Thanks in advance

Nigel

Nigel Lloyd
Bridges & Structures Engineer
DD s9(2)(a)
M
E nigel.lloyd@nzta.govt.nz

TNZ C26 NOTES: 2003

NOTES FOR THE CLEANING AND RECOATING OF STEELWORK COATED WITH LEAD BASED PAINT

These notes are for the guidance of Transit New Zealand's consultants, and ***must not be included*** *in the Contract Documents.*

1. SCOPE

Transit New Zealand Specification C/26 should be used for the maintenance painting of structural steelwork where existing coating system contains concentrations of lead greater than 1% by weight. These Notes discuss the additional specification clauses that need to be written to suit the particular structure and provide additional information for use by specifiers. The specification does not cover any traffic management requirements that will need to be referenced separately.

2. DESCRIPTION OF WORK

Additional specification clauses will be required that give a description and location of the highway structure and the extent of maintenance painting that is required. This may include appending a Locality Plan, together with as-built drawings and/or photographs. If only part of the structure requires repainting, the inclusion of marked-up drawings showing the exact extent of the refurbishment work will be necessary.

Also include in the Tender Documents any information known about the existing system from records or a site assessment.

3. CONTAINMENT (Clause 2.2.2)

The specifier should carry out a risk assessment for the project as set out in Transfund New Zealand Research Report 115 and specify the required level of emission control that is required.

Suggested wording for the relevant specification clause is given below.

> "Using the criteria given in the Transfund New Zealand Research Report 115 *Guidelines for the Management of Lead-based Paints on Roading Structures;*
> The public health risk for this project has been designated as ....., *(INSERT "HIGH", "MODERATE", "LOW", OR "NIL").*

The environmental risk as ..... *(INSERT "HIGH" OR "LOW").*
The risk to adjacent workers as.....(*INSERT "HIGH", "LOW" OR "NIL"*).

The minimum project-specific emission control level required is therefore Level .... *(INSERT "A", "B", OR "C")* which will govern the combination of paint removal methods and containment systems to be used on this project."

Refer to Appendix C of AS 4361.1 for additional guidance in assessing these risks and establishing the control level. Note that AS 4361.1 defines a "small project" as one where less than 10sqm of lead-based paint will be removed within a 12 month period, and that its requirements need not apply unless "in the immediate proximity of a sensitive receptor" (eg a kindergarten). However these small projects, eg bridge handrails, would still be subject to applicable regulatory requirements including worker protection and waste management.

4. WASTE DISPOSAL (Clause 2.2.3)

As the quantity of lead contaminated waste and hence the cost of its treatment and disposal may not be known at the time of tender; it is an option that this be treated as a Provisional Sum item. This will also ensure that the Contractor will not be tempted to cut corners in disposal of waste or build a large risk element into the tendered price. It is therefore recommended that Specifiers include an additional clause to cover payment of waste disposal as follows**;**

"The Principal will reimburse the Contractor, at cost, for:

a. The cost of transporting the waste from the project to the treatment plant/disposal site, and

b. The cost of treating and/or disposing of the waste, including payment of any disposal fees or special Consents."

On the other hand, if waste disposal is included as priced Scheduled Item, there is incentive for the Contractor to minimise waste and be more innovative regarding its treatment. Specifiers should determine which option is the most appropriate for their particular project.

5. ENVIRONMENTAL MONITORING (Section 4)

The Schedule of Rates in the Tender Document should include a suitable Provisional Sum Item to cover any soil and water testing and air monitoring where required by the Resource Consent. The Engineer will need to determine whether or not they wish to be directly responsible for the environmental monitoring or delegate this to the Third Party Inspector, and add amending clauses where appropriate.

6. THIRD PARTY INSPECTION (TPI) (Section 5)

This section will require amendment where the Consultant wishes to provide inspection by suitably qualified and experienced members of their own staff or hire the TPI directly. Where the Contractor is to provide the TPI payment should be made via a separate Scheduled Item or Provisional Sum. Where it is to be a via a Scheduled Item it will be necessary to specify the frequency of attendance as an addendum to Clause 5.1.2, ie. whether the TPI is to be on site continuously/daily/alternate days/ or weekly during surface preparation and coating application. Hold points listed in Clause 5.2 may be amended to suit the location and system being applied.

7. COATING SYSTEM (Clause 8.1)

7.1 Selection and Specification of Systems

Selection of the most suitable and cost effective coating system depends on;

a. the proximity of the structure to the coast and wind-borne salts,

b. whether encapsulation, a spot repair, or total replacement is required,

c. the generic type and adhesion of the existing coating to be overcoated,

d. the required time until next maintenance,

e. aesthetic requirements (eg colour, gloss levels, anti-graffiti resistance),

f. the prevailing weather conditions (eg temperature and humidity),

g. the time available for recoating (eg rapid cure system or metal spray required),

h. the presence of crevices (eg from riveted or bolted joints),

i. the amount of pitting of the steelwork (found once abrasive blasting has been completed), and

j. the degree of surface preparation (eg if abrasive blasting is not used)

The specifier should prepare a detailed specification for the coating system to be used on the work. This should be in a generic format to allow competitive tendering of different brands that can be shown to comply with the material specification. As a general rule, the better the standard of surface preparation, the longer the coating system will perform. However the higher standard of preparation may increase the quantity of hazardous material to be contained and disposed of. It is recommended that for major works, a detailed job specific coating specification be prepared by a reputable coating manufacturer or independent coating consultant after an assessment has been made of the existing coating condition (refer Appendix B of AS 4361.1). A useful checklist giving the steps involved in planning for maintenance painting is presented as Appendix A3 in AS/NZS 2312.

Typical systems used for the maintenance painting of highway structures are summarised in the Table on page 7, and may be specified where appropriate for minor works as discussed below. In some situations it may be desirable to invite tenders for more than one of the following outline specifications to obtain comparative prices. Where available their **system designation** in accordance with AS/NZS 2312:2002 has also been included. For major structures, expert advice should be sought. Note that NCHRP Synthesis 251: *Lead-Based Paint Removal for Steel Highway Bridges* reported in 1997 that US roading authorities "had a strong preference for moisture-cured urethane systems" and FHWA-RD-96-058 *Environmentally Acceptable Materials for the Corrosion Protection of Steel Bridges* found thermal metal spray systems had the lowest Life Cycle Cost.

7.2 Outline Coating System Specifications

No.1 Power tool clean rusted areas to St 2 and prime with a zinc phosphate alkyd applied by brush to give a minimum dry film thickness (DFT) of 40µm. Apply one spot coat and one full finish coat of micaceous iron oxide (MIO) pigmented alkyd enamel to give a minimum total dry film thickness (TDFT) of 120µm (**ALK6**).

No.2 Power tool clean rusted areas to St 2 and prime with a 100% solids low viscosity epoxy penetrating sealer applied by brush to give a minimum DFT of 25µm. Apply one full finish coat of MIO pigmented epoxy mastic to give a minimum TDFT of 150µm.

No.3 Power tool clean rusted areas to St 2 and prime with an aluminium pigmented aromatic moisture cured urethane (MCU) penetrating sealer applied by brush to give a minimum DFT of 50µm. Apply one full finish coat of MIO pigmented aliphatic MCU to give a minimum TDFT of 100µm.

These three coat spot repair systems may be suitable to extend the life of an existing lead-based system (5 - 10 years) in a medium corrosivity environment where the structure is to be replaced or existing coating system is to be fully removed in the future. They may also be suitable for use in low corrosivity environments as encapsulation systems, with water washing as the only preparation (ie minimal hazardous waste material generated).

No.4 Clean rusted areas by wet slurry blasting to WAB-6 or water jetting to WJ-2 and prime with 50µm of brush applied zinc phosphate pigmented epoxy. Spot paint with 125µm of MIO epoxy mastic and apply a 50µm tie coat of epoxy mastic to remaining surfaces. Apply a 100µm finish coat of MIO pigmented epoxy.

No.5 Clean rusted areas by wet slurry blasting to WAB-6 or water jetting to WJ-2 and prime with 50µm of brush applied zinc/MIO pigmented MCU. Spot paint with 75µm of MIO MCU and apply a 50µm tie coat of MIO aromatic MCU to remaining surfaces. Apply a 50µm finish coat of MIO aliphatic MCU.

Systems 4 & 5 may be suitable to extend the life of a generally sound existing lead-based coating system in a medium corrosivity environment where full removal is not warranted. Systems 2, 4 & 10 should be confirmed as suitable by applying a test patch one month (or ideally 12 months) prior to repainting and check for possible delamination.

No.6 Remove all previous coating by abrasive blasting to Sa 2½. Prime with 75µm of zinc-rich epoxy and apply a 125µm build coat of MIO pigmented epoxy mastic (or high build epoxy). Apply a 125µm finish coat MIO high build epoxy (EHB6).

No.7 Remove all previous coating by abrasive blasting to Sa 2½. Prime with 75µm of zinc rich MCU and apply a 75µm build coat of MIO pigmented aromatic MCU. Apply a 75µm finish coat of MIO aliphatic MCU (MCU2).

No.8 Remove all previous coating by abrasive blasting to Sa 3. Apply a single 100µm coat of inorganic zinc silicate, or 125 µm of thermal zinc spray, or remove and hot-dip galvanize to AS/NZS 4680 (HDG600).

No.9 Power tool clean rusted areas to St 2 and prime with 75µm of brush applied zinc/MIO pigmented MCU. Spot paint with 75µm of MIO MCU and apply a 50µm tie coat of MIO aromatic MCU to remaining surfaces. Apply a 75µm finish coat of MIO aliphatic MCU.

No.10 Clean rusted areas by wet slurry blasting to WAB-6 or water jetting to WJ-2 and prime with 75µm of brush applied zinc phosphate pigmented epoxy. Spot paint with 125µm of MIO epoxy mastic and apply a 50µm tie coat of epoxy mastic to remaining surfaces. Apply a 125µm finish coat of MIO pigmented epoxy.

No.11 Clean rusted areas by wet slurry blasting to WAB-6 or water jetting to WJ-2 and prime with 75µm of brush applied zinc/MIO pigmented MCU. Spot paint with 75µm of MIO MCU and apply a 50µm tie coat of MIO aromatic MCU to remaining surfaces. Apply a 75µm finish coat of MIO aliphatic MCU.

Systems 10 & 11 may be suitable to extend the life of a generally sound existing lead-based coating system where full removal is not warranted. System 10 should be confirmed as suitable by applying a test patch 12 months prior to repainting. MCU systems tend to apply less stress to aged coatings but a minimum adhesion strength of 1.5 MPa in the existing coating is preferred to prevent its delamination.

No.12 Remove all previous coating by abrasive blasting to Sa 2½. Prime with 75µm of zinc-rich epoxy and apply a 175µm build coat of MIO pigmented high build epoxy. Apply a 150µm finish coat MIO high build epoxy.

No.13 Remove all previous coating by abrasive blasting to Sa 2½. Prime with 75µm of inorganic zinc silicate. Apply a full 150µm intermediate coat and 150µm finish coat of MIO high build epoxy.

No.14 Remove all previous coating by abrasive blasting to Sa 2½. Apply a single 125µm coat of inorganic zinc silicate (Type 6 to AS/NZS 3750.15) (IZS3).

No.15 Remove all previous coating by abrasive blasting to Sa 3. Apply 150µm of thermal zinc spray (TSZ150).

Systems 7, 12, 13, 14 & 15 may be suitable for use in high corrosivity (eg. marine) environments where full removal and replacement of the existing lead-based system is required. Zinc metal spray thickness can be increased to give 40+ years life till next maintenance if required (Refer to AS/NZS 2312 Table 5.1).

7.3 Additional Notes

In very high corrosivity (severe marine) environments, Systems 12, 13, or 14 may be used but apply an additional intermediate coat to all surfaces sheltered from rain-washing. On other surfaces apply an additional intermediate coat to all edges, welds, fasteners and downward facing surfaces. Alternatively use thermal metal spray systems **TSZ200S** or **TSA150S**.

Where a colour finish and/or graffiti resistance is required, the MIO HBE finish coat in Systems 4, 6, 10, 12, & 13 should be replaced with a 75µm coat of catalysed two-pack polyurethane conforming to AS/NZS 3750.6. MCU is available in a limited range of colours, in flat with MIO or semi-gloss without MIO, and is now specified in AS 3750.18.

Systems 8, 14 & 15 should only be used where steel is in good condition (ie not badly pitted and on relatively smooth large sections (eg large I-beams and not riveted or bolted plates, or lattice steelwork) because of difficulties in obtaining uniform film thickness.

Surface preparation cleanliness standards are in terms of the widely known Swedish Standard SIS 05 5900 (which has been incorporated into ISO 8501-1 and NZS/AS 1627.9). Sa 2½ is a “near-white” abrasive cleaned surface, which is similar to SSPC SP10. Sa2 = SSPC SP6, and Sa 3 = SSPC SP5. St 2 is a “thoroughly tool cleaned” surface. Note that it is important not to burnish the surface when power wire brushing as this will reduce adhesion of the primer. Water Jetting and Wet Abrasive Blast cleanliness standards are given in SSPC-VIS 4 and SSPC–VIS 5 respectively. (WAB-6 = WJ-2 = Sa 2). Also note that many coating manufacturers do not endorse the use of corrosion inhibitors when wet abrasive blasting as these may compromise primer adhesion and also mask the presence of salt contaminants.

The job specification should include maximum as well as minimum DFT’s permitted for each coat in the system. (This is particularly important when overcoating with epoxy material). Also check that the blast profile specified in clause 7.4 is appropriate and amend with an additional clause if necessary.

Further information on the Australian Paint Approvals Scheme referenced in Clause 6.1 may be obtained from the web site www.apas.gov.au. Note that APAS took over administration of the NZ Paint Approval Scheme (NZPASS) from Telarc on 1 January 2002.

BIBLIOGRAPHY

For additional information refer to the following publications;

AS/NZS 2312:2002, "Guide to the protection of structural steel work against atmospheric corrosion by the use of protective coatings".

AS 4361.1-1995: "Guide to Lead Paint Management Part 1: Industrial Applications".

AS/NZS 4680:1999, "Hot-dip galvanized (zinc) coatings on fabricated ferrous articles".

'After-Fabrication Hot Dip Galvanizing' (15th edition), published by the Galvanizers Association of Australia (1999)

APAS List of Approved Products (30th edition) published by Australian Government Analytical Laboratories (2000)

BS EN ISO 14713: 1999 'Protection against corrosion of iron and steel in structures – Zinc and aluminium coatings – Guidelines'

'Guide for Painting Steel Structures', published by AASHTO (1997)

Industrial Lead Paint Removal Handbook (2nd edition) by K A Trimber (SSPC 93-02)

NCHRP Synthesis 251: 'Lead-Based Paint Removal for Steel Highway Bridges'

Steel Structures Painting Manual, Volume 2 (8th edition), published by SSPC (2000) (in particular SSPC-Guide 6 on containment of hazardous debris & SSPC- Guide 7 on waste disposal).

SSPC-SP 12/NACE 5: 'Surface Preparation and Cleaning of Steel and Other Hard Materials by High- and Ultrahigh-Pressure Water Jetting Prior to Recoating' (SSPC 96-05)

SSPC-VIS 4/NACE VIS 7 'Guide and Reference Photographs for Steel Surfaces Prepared by Waterjetting' (SSPC 01-05).

SSPC-VIS 5/NACE VIS 9 'Guide and Reference Photographs for Steel Surfaces Prepared by Wet Abrasive Blast Cleaning' (SSPC 01-06).

Szokolik & Rapattoni, (1998); "A Guide to the Use of Coatings for the Protection of New Steel Bridges Against Atmospheric Corrosion", BHP.

Ref No.	*Life*	*Environment*	*Prep. Std.*	*Primer Coat*	*DFT µm*	*Build/Tie Coat*	*DFT µm*	*Finish Coat*	*DFT µm*	*TDFT µm*
1	*Short*	*Moderate*	*St 2*	*ZPA*	*50*	*MIOA*	*50*	*MIOA*	*50*	*150*
2				*EPS*	*25*	-		*MIO EM*	*125*	*150*
3				*Al MCU*	*50*	-		*MIO-MCU*	*50*	*100*
4	*Medium*		*Sa 2*	*ZPE*	*50*	*MIOEM*	*125*	*MIO HBE*	*100*	*275*
5				*Zn/MIO MCU*	*50*	*MIO MCU*	*75*	*MCU*	*50*	*175*
6	*Long*		*Sa 2½*	*ZnE*	*75*	*MIOEM*	*125*	*MIO HBE*	*100*	*300*
7				*Zn MCU*	*75*	*MIO MCU*	*75*	*MIO MCU*	*75*	*225*
8			*Sa 3*	*TSZ*	*125*	-	-	-	-	*125*
				IZS	*100*	-	-	-	-	*100*
			Pickle	*Hot-dip Galvanize*	*85 min.*					*85 min.*
9	*Medium*	*Marine*	*St 2*	*Zn/MIO MCU*	*75*	*MIO MCU*	*75*	*MIO MCU*	*75*	*225*
10			*Sa 2*	*ZPE*	*75*	*MIO EM*	*125*	*MIO HBE*	*125*	*325*
11				*Zn/MIO MCU*	*75*	*MIO MCU*	*75*	*MIO MCU*	*75*	*225*
12	*Long*		*Sa 2½*	*ZnE*	*75*	*MIO HBE*	*175*	*MIO HBE*	*150*	*400*
7				*Zn MCU*	*75*	*MIO MCU*	*75*	*MIO MCU*	*75*	*225*
13				*IZS*	*75*	*MIO HBE*	*150*	*MIO HBE*	*150*	*375*
14			*Sa 3*	*TSZ*	*150*	-	-	-	-	*150*
15				*IZS-HR*	*125*	-	-	-	-	*125*

EM = Epoxy mastic *EPS = Epoxy penetrating sealer* *HBE = High build epoxy* *IZS = Inorganic Zinc Silicate*
IZS-HR = "High-ratio" IZS *MIO = Micaceous iron oxide* *MCU = Moisture cured urethane* *TSZ = Thermal Sprayed Zinc*
ZnE = Zinc epoxy *ZPA = Zinc phosphate alkyd* *ZPE = Zinc phosphate epoxy.*